

COMPUTED TOMOGRAPHY FINDINGS OF DOGS WITH MEDIAL CORONOID DISEASE

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Abstract

Canine elbow dysplasia is an heritable orthopaedic disease which includes medial coronoid disease, osteochondritis dissecans and ununited anconeal process, as well as, elbow incongruity. Medial coronoid disease (MCD) is one of the most frequent part of elbow dysplasia syndrome. The aim of the study was to describe medial coronoid process CT findings in dogs with thoracic limb lameness. In cases where there is suspicion of medial coronoid disease for dogs with lameness, an orthopaedic examination and CT were performed. CT examination was done with Philips MX-16 – slice CT scanner. The study represents data from a time frame between September 2014 and December 2015. Examinations were done at The Faculty of Veterinary Medicine, Latvia University of Agriculture. The study included 20 large breed dogs, 14 males and 6 females, ages ranging from 6 to 60 months, with a median age of 21.7 ± 13.7 months. Results showed that, in most cases, the dogs had subtrochlear sclerosis of the ulna and fragmentation of medial coronoid. Computed tomography revealed 12 dogs with medial coronoid disease in both elbows, whereas 8 dogs only in one of the elbow joints.

Key words: canine elbow dysplasia, joints, orthopaedic disease, congenital disease, biceps muscle.

Introduction

Canine elbow dysplasia (ED) is a disease of elbow joints in dogs (*Canis lupus familiaris*). According to the International elbow working group (IEWG) definition, elbow dysplasia includes – medial coronoid disease, osteochondritis dissecans, ununited anconeal process, elbow incongruity (Kirberger & Fourie, 1998) and secondary arthrosis caused by these pathologies (Lang *et al.*, 1998).

Medial coronoid disease (MCD) is the most frequently diagnosed component of the elbow dysplasia syndrome (Lau *et al.*, 2015). Medial coronoid disease is a common debilitating condition of large and giant breed dogs (German Shepherd dogs, Rottweilers, Bernese Mountain dogs), however, medial coronoid disease has also been described in small-breed dogs (French Bulldog, English Cocker Spaniel) (Bakker *et al.*, 2013).

MCD includes different pathologies, however, in the most cases, the diagnose is ulnar subtrochlear sclerosis (STS), blurring of the cranial edge of the medial coronoid process (MCP), MCP fragmentation and displaced fragment (Temwichitr, Leegwater, & Hazewinkel, 2010; Lau *et al.*, 2015). Medial coronoid disease can be caused by multiple factors and etiology is still unclear. It is considered that environmental factors and genetic heritability play a role in predisposing dogs to this syndrome (Kirberger & Fourie, 1998; Micheflsen, 2013). Although causes of this disease are not entirely clear, however the latest research studies show that the disturbance of endochondral ossification and osteonecrosis play a major role in the development of this disease (Mariee, Gröne, & Theyse, 2014). In some cases, medial coronoid disease can be considered together with flexor enthesopathy (Bakker *et al.*, 2013).

Radiography, computed tomography (CT), magnetic resonance imaging (MRI), arthroscopy, nuclear scintigraphy and micro-single photon emission tomography have been suggested for the diagnosis of pathologies in the elbow joints (Kirberger & Fourie, 1998; Villamonte-Chevalier *et al.*, 2015). These techniques are representative, but some of them are very expensive and not always are available (Villamonte-Chevalier *et al.*, 2015). Computed tomography is more sensitive than radiographs and is very often used in veterinary clinics to diagnose elbow dysplasia (Kunst *et al.*, 2014; Villamonte-Chevalier *et al.*, 2015).

Until now, no studies have been performed in Latvia on canine elbow dysplasia, although this syndrome has been spread among dogs of various breeds.

The aim of the study was to describe medial coronoid process CT findings in dogs with thoracic limb lameness. We hypothesized that dogs with medial coronoid disease often have ulnar subtrochlear sclerosis and fragmentation of medial coronoid.

It is important to describe and study the cause of elbow dysplasia syndrome, because the breed dog reproduction in Latvia is increasing and if the dogs are diagnosed with elbow dysplasia, one of the main tasks should be the elimination of reproduction of these dogs.

Materials and Methods

The study represents data from a time frame between September 2014 and December 2015. All examinations were done at the Faculty of Veterinary Medicine, Latvia University of Agriculture.

The study included 20 dogs, 14 males (70%) and 6 females (30%); ages ranging from 6 to 60 months,

with a median age of 21.7 ± 13.7 months. The median body weight was 35.4 ± 7.6 kg (range 22 – 40 kg). The study included nine breeds – German Sheppard dog (6), Labrador retriever (5), Golden retriever (2), Burmese Mountain dog (2), Rottweiler (1), Cane Corso (1), Pyrenees Mountain dog (1), King Charles spaniel (1), Weimaraner (1).

A general clinical and orthopaedic examination was performed for all dogs. Afterwards, if a medial coronoid disease was suspected, then a computed tomography of elbow joints was performed. All dogs had a history of intermittent or persistent lameness and pain reaction on joint extension and flexion. Blood creatinine and carbamide (Urea) values were obtained prior to the computed tomography and if results formed part of the reference intervals (Meyer & Harvey, 2008), then dogs were included in our research.

Dogs were anaesthetized with propofol 5 mg kg^{-1} of body weight administered intravenously and after that endotracheal intubation carried out. During the CT examination, anaesthesia was maintained with Isofluran and 100% oxygen. Patient heartbeat, blood pressure, breathing, oxygen saturation and body temperature were monitored using Bionet BM3 Vet veterinary monitor.

Computed tomography examination was done using Philips MX – 16- slice CT scanner. At the time of CT scanning, dogs were positioned in dorsal recumbency on the scanner table with the front limbs extended cranially and the antebrachial parallel to each other.

The first scan from the carpus up to the collum of the scapula was done using the soft tissue and bone reconstructions, with the technical parameter – 120 kVp (kilovoltage peak) and 2 mm slice thickness and scan for elbow joints using 120 kVp and 0.7 mm slice thickness.

Before the second CT scan, non-ionic contrast media (Ultravist 300, 2 mL kg^{-1}) was administered intravenously. The second scan was from the carpus up to the collum of the scapula with 2 mm slice thickness and scan for both elbow joints using high resolution scans (0.7 mm slice thickness) in a bone reconstruction has been done two minutes after giving the contrast media. High-resolution CT is faster, less invasive, and more accurate than other scans.

Data were analysed using Horos medical image viewer and descriptive statistics were used.

Results and Discussion

Most of the included dogs were large and fast growing breeds, however, one King Charles spaniel was included in the study with the fragmentation of medial coronoid and it coincides with the literature, that MCD has also been described in the small-breed

dogs (Bakker *et al.*, 2013). Of the 20 dogs, 14 were male and this coincides with some authors' view, that MCD often occurs in male dogs (Hazewinkel & Voorhout, 1986; sVillamonte-Chevalier *et al.*, 2015).

Usually for canine elbow dysplasia CT examination using of contrast media is not necessary, but in our cases it was important for further research to do muscle morphometric measurements. Blood analysis has been done before the contrast media accumulation, to figure out the kidney functional condition, because the contrast media excrets through kidneys. The included dogs' blood creatinine and Urea values formed part of the reference intervals.

Computed tomography revealed that 12 (60%) dogs had the medial coronoid disease in both elbows, but 8 dogs (40%) in one of the elbow joints. A total of 40 elbow joints were analysed during the study.

Computed tomography results showed that 34 (85%) joints had ulnar subtrochlear sclerosis, 24 (60%) fragmented medial coronoid disease (FMCD) and 14 (35%) joints had arthritic changes. Incongruity of the elbow joints was not found. High resolution computed tomography scans were used in this study and reconstructed data were reconstructe using a sharp bone algorithm, and it provided an opportunity to assess more accurately the elbow joints and describe pathological changes (Baker *et al.*, 1988).

Our research results showed, that STS was diagnosed in 34 of 40 elbow joints, but 14 joints had fragmented medial coronoid and 11 dogs were male with a majority of German Shepherd dogs, Labradors, Golden Retrievers and Barnese Mountain dogs. Considering that, one of the most common findings of MCD is the fragmentation of medial coronoid disease (Fitzpatrick *et al.*, 2009). In most of the cases, the joints with fragmented medial coronoid also had subtrochlear sclerosis of ulna, which may indicate that STS is an early change and other pathologies develop later. STS can be used as an indicator of medial coronoid disease (Fitzpatrick *et al.*, 2009).

CT findings in our study show similar results as previous research and support the hypothesis that dogs with MCD often have ulnar subtrochlear sclerosis and fragmentation of medial coronoid.

Although the findings of medial coronoid disease have been already described in several studies in other countries, so far there have been studies on elbow dysplasia in dogs in Latvia. On the first stage of our study results, it is important to make further measurements of developing the medial coronoid disease causes and to determine the correlation between biceps muscle conformation and MCD. These measurements are important because there is a perception, that biceps/brachialis muscle forces could play a role in the development of MCD (Michelsen, 2013).

Conclusions

1. Subtrochlear sclerosis of the ulna is an early indicator of canine medial coronoid disease and might be diagnosed before the development of other pathological changes in elbow joints.
2. Medial coronoid disease is a common orthopaedic pathology with a prevalence mainly among fast growing large breeds and more often affects young male dogs with a majority of them being German Shepherd dogs and Labrador retrievers.

3. High resolution computed tomography scans with 0.7 mm slice thickness, provide a greater information about elbow joints and facilitate medial coronoid disease diagnostics, which is important in particular when the disease is at an early stage.

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